FOREST SURVEY NO. 1 MAY 1, 1935

ECONOMIC NOTES

PRELIMINARY STATISTICS AND ANALYSIS OF DATA OBTAINED FROM FOREST SURVEYS AND OTHER ECONOMIC STUDIES

BY THE

LAKE STATES FOREST EXPERIMENT STATION

UNIVERSITY FARM — ST. PAUL, MINNESOTA

THE FORESTS OF MINNESOTA

AREAS AND TYPES

U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

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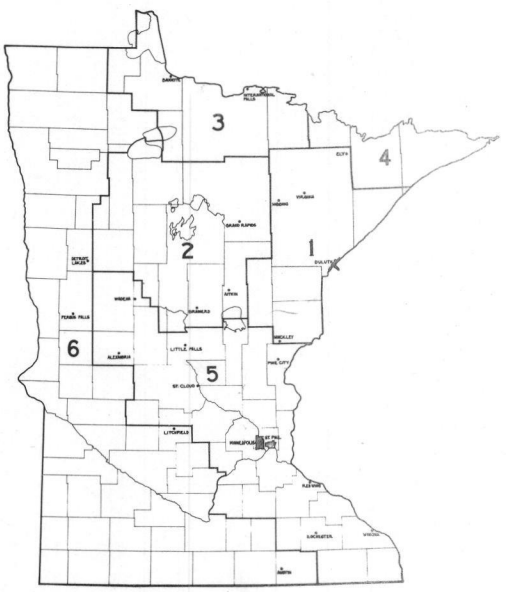

Advance figures subject to correction and amplification in final report.

FOREWORD

Fundamental to sound planning in either public or private forestry are reliable basic data on the local and national timber situation.

From time to time, estimates have been made of the volume of timber left standing in the country, current rate of growth contrasted with the rate of depletion, and forecasts made of future timber needs. At no time, however, until the National Forest Survey was authorized by the McSweeney-McNary Act in 1928 was any systematic effort made to carry on a complete field survey to gather the needed information.

The present Forest Survey, which is now under way in most of the important forest regions of the country, is such a field survey. The five-fold aim of this survey is:

(1) Inventory. To take stock of the supply of timber and other forest products and the areas of land available for growing timber. This information is collected by natural economic units tributary to certain groups of wood-using industries. Ownership and availability of the timber are also considered.

(2) Growth. To ascertain the current rate of growth and the growth prospects under different types of management - mere protection, extensive management, and intensive management.

(3) Drain. To determine the rate of depletion from industrial and local timber use, windfall, fire, insects and disease.

(4) Requirements. To determine the present consumption and the probable future trend in the requirements for timber and other forest products.

(5) Conclusions. To correlate these findings with existing and anticipated economic conditions in order that policies can be formulated for the effective use of land available for forest production. Locally, this will often involve an analysis of the cutting budgets of individual companies and consideration of steps necessary to maintain economic units on a self-sustained basis.

The Forest Survey is an activity of the Division of Research, Forest Service, U. S. Department of Agriculture. The Minnesota Survey is conducted by the Lake States Forest Experiment Station with the co-operation of the Minnesota Department of Conservation.

THE FORESTS OF MINNESOTA

Areas and Types*

The effects of a century of lumbering, homesteading and land clearing upon the native forests of Minnesota are reflected in the forest inventory just completed by the Lake States Forest Experiment Station. This inventory, a complete field survey of Minnesota timberland, shows the extent of permanent clearing, the decline in virgin timber area, the changes wrought by fire and logging in the type and composition of the forest, and, on the more hopeful side, the extent of re-growth and natural reforestation which has taken place in recent years.

The original forest area of Minnesota was 31,500,000 acres, more or less. The indicated area in 1934 was 19,615,000 acres, a decline of 37.7 per cent. Most of this reduction can be charged to agricultural clearing, a smaller area going into cities, villages, roads and miscellaneous industrial uses.

The extent of old growth sawtimber in the original forest is not accurately known. Large areas of swamp, aspen and scrub oak were never of merchantable size and it is known that there were destructive fires even in the early days, so probably not over a third of the original forest was virgin sawtimber when logging first started in the State. Even so, the contrast with present day forests is striking. Only one-third of a million acres of the remaining forest can be classified as old growth and much of this has been culled over or partially burned. In round numbers, three per cent of the original virgin sawtimber forest remains.

Logging and forest fires have changed many of the forest types so that over extensive areas, aspen, paper birch, scrub oak or simply brush are the predominant features of the present cover. On pine lands, in place of large white and Norway pine, we now have jack pine, aspen, scrub oak, sweet fern and blueberries. On hardwood lands, in place of the tall clear sugar maple, basswood and elm, we have mainly short deformed oak or second growth aspen, a product of repeated culling, light burning and over-grazing. Other types have suffered the same fate in varying degree.

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*The estimate of forest areas and timber volumes was obtained in 1934 by means of a line plot survey in which nearly 5,000 miles of survey line were run and close to 40,000 sample plots measured.

Amid this general picture of devastation, there are a number of areas of greater or less extent which stand out as oases and examples of what even cut-over lands may become with reasonable care and protection. The Superior National Forest district, burned over almost completely 70 years ago, now has a third of its area covered with jack pine and spruce cordwood or sawtimber, and a still greater area of promising young growth. The Chippewa National Forest, the White Earth State Forest, Itasca Park, are other examples of Nature's response to reasonable forest treatment in Minnesota. Private lands which have been protected from fire show equally favorable regeneration. All in all, 8,074,600 acres, or two-fifths of the present forest area, either now support or are becoming restocked to the original type of forest growth.

Forest area statistics alone are an insufficient basis for building forest policies and a full knowledge of the present forest situation in the State will only be obtained when the area data is combined with figures on timber volumes, rate of growth and present rate of depletion, facts which will later be obtained in the forest survey being made of the State. The area figures alone, however, uncover some very significant facts and lead to a better understanding of what must be the objectives of public forest policy. The badly run-down condition of the forest lands, the shortage of area in sawtimber and even in cordwood stands, suggests that one of the primary aims of public forest agencies must be to conserve - if necessary acquire - the remaining growing stock while the deforested and restocking lands are put back into a more productive condition. The most acute problem in the State apparently is not to provide forests for people generations hence. There is a large area of promising reproduction and other large areas which through natural or artificial reforestation will produce vast quantities of timber 100 years from now. But there is a comparatively small area which is ready to produce merchantable timber now, ten years from now, and twenty years from now. Unless these areas are conserved and intelligently managed, Minnesota must look forward to a time in the not distant future when many of her remaining forest industries will have to close.

ORIGINAL FORESTS OF MINNESOTA

Original Forest

The early day forests of Minnesota, although extremely varied in composition can be grouped under a half dozen broad types of about the following extent:*

Pine	5,800,000 acres
Spruce-balsam	6,300,000 "
Coniferous swamp	6,100,000 "
Hardwoods	8,400,000 "
Bottomland hardwoods	2,000,000 "
Aspen-scrub oak	2,900,000 "
Total	31,500,000 acres

*The area of original types is based mainly upon a map prepared by F. J. Marschner, Bureau of Agricultural Economics, which was compiled in 1930 from old General Land Office field notes. Some type interpretations were made to permit comparison with the present survey data.

The first three types, the coniferous forests, occupied the northeastern third of the State, roughly west as far as Roseau, Bagley and Wadena, south as far as Little Falls, Milaca, and Pine City. The hardwoods, aspen and oak, occupied a transitional belt between the conifers and the open prairie, extending all of the way from the Canadian line to the border with Iowa on the south. The bottomland hardwoods were found in narrow strips throughout the State.

The area described as pine land includes the tracts of very sandy soils upon which one or more of the pines predominated in the original forest. On some of the stony moraines and areas of more finely grained soil with favorable moisture conditions,

Pine

white pine or mixtures of white and Norway pine were found. On slightly poorer and drier sites the Norway pine took the lead while the driest outwash plains and recently burned areas were dominated by jack pine. Relics of the virgin pine forests can be seen at Itasca Park, Cass Lake, the city park at Little Falls, Scenic State Park, and along the Gunflint Trail of the Superior National Forest.

The spruce-balsam forests were found on heavier soils in the cool, moist region in the northernmost part of the State. Similar forests extend a considerable distance north into Canada and east to the Atlantic Coast. The type was common on the

Spruce
Balsam

uplands, north of Duluth, Grand Rapids and Bemidji, and was found bordering swamps as far south as Mille Lacs. The characteristic tree in this type in Minnesota was the balsam-fir although a great many other species were commonly associated with it, such as white spruce, black spruce, paper birch, aspen and white cedar. Almost pure stands of white spruce were found in some localities while the areas swept by forest fires were usually dominated for a time at least by aspen and paper birch. On the rough, rocky lands in northern Lake and Cook counties, a mixture of black spruce and jack pine was included in this type.

Minnesota is supposed to have had over 7,000,000 acres of swamp or peat land resulting in the main from drying up and filling up of old glacial lakes. The largest of these muskeg areas lay in the northwestern corner of the State in the bed of glacial Lake Agasis, the second largest in the territory between Duluth and Grand Rapids, in what used to be Lake Upham and Lake Aitkin. Almost the entire 5,500,000 acres of swamp which lay in the northern coniferous belt were in some degree forested. The coldest and most poorly drained swamps carried a stunted and scattered growth of black spruce and tamarack, of little or no commercial value. Better drained and shallower peat lands had a more thrifty growth of these species together with white cedar, balsam, and occasional hardwoods. For any considerable area, a stand of five cords per acre was considered fairly good for swamp forests.

Coniferous Swamps

Except around swamp borders and on the margin of streams, very little material reached sawtimber size.

The virgin Minnesota hardwoods had some of the characteristics of the northern hardwood type of Wisconsin and Michigan, some of the central oak-hickory type of Illinois, and some characteristics of their own, due to proximity to the northern prairie. The so-called "Big Woods" west of the Twin Cities, which were made up principally of thrifty sugar maple, basswood, red oak and elm, approached more closely than any other the typical northern hardwood type. Notably absent were the hemlock and beech and relatively rare was the yellow birch. The forests along the "breaks" of the Mississippi from Lake Pepin to the south boundary of the State were similar in many respects to the oak-hickory forests of the central hardwood region.

Hardwoods

The predominant trees were the red and white oaks, elm and basswood, but there was a sprinkling of the more southern trees such as walnut, butternut, hickory, honey locust, Kentucky coffee tree, hackberry, etc. As it approached the prairie, particularly to the northwest, the hardwood forest became progressively poorer in variety of species and in quality of timber. The characteristic tree was the short, limby burr oak grown in scattered stands or groves and producing at best but a single sawlog or railroad tie. Stands of hardwood ranged from less than a thousand up to 5 or 10 thousand board feet per acre. Incidentally, some of the best white pine timber was cut from essentially hardwood land.

The narrow strips of bottomland hardwoods were made up primarily of black ash, American elm, and Balm of Gilead. Other associates in the coniferous forest region were balsam fir, white cedar, yellow birch and red maple; in the hardwood region, hackberry, green ash, black willow and silver maple; in the prairie section, green ash, cottonwood and box elder. There were never any extensive forests of this type, but the aggregate area over the State was considerable.

Bottomland Forests

On the very sandy areas along the Mississippi River and in the "brush prairies" of the northwest, there occurred a scrub growth of jack, scarlet and burr oaks, aspen, Balm of Gilead, willows and a few other trees of such distinctly poor quality that they justify separate classification. These forests were practically incapable of producing sawlogs or pulpwood according to the usual standards, and in some cases were valueless even for fuel.

Scrub

PRESENT FOREST AREA

Approximately one-third of the original forest area has been taken permanently for other uses during the past century, leaving 19,615,400 acres of forest land. From the figures in Table I, it will be seen that the greatest reductions have been made in the hardwood and scrub types, over half of these areas being cleared for agriculture or used for towns, roads, golf courses, etc. The least change from a gross area standpoint has occurred in the coniferous swamp types, since these areas have proved unsuitable for most other uses. The only accretion in forest area is in the case of shelterbelts planted in the prairie region. These plantations, put in primarily for aesthetic and protection purposes, also have some bearing upon the question of wood supplies. They yield considerable quantities of firewood annually.

For data on western Minnesota shelterbelts, the Station is indebted to Mr. M. E. Deters, Division of Forestry, University of Minnesota.

Of the remaining forest area, slightly over two-fifths is still occupied by the original forest type - the remainder has been taken over temporarily at least by aspen, scrub oak, brush or other inferior cover. Table 2 shows the situation in each of the primary types. As would be expected, deforestation is most marked in the upland coniferous types.

Aspen and scrub oak, which are considered a permanent type on only about 681,300 acres of prairie margin, have been greatly encouraged by fire and logging, and now occupy 7,417,700 acres or over one-third of the total forest area. More or less complete deforestation is noted on 4,123,100 acres or 21 per cent of the gross forest area.

CHARACTER OF COVER ON REMAINING FOREST AREA

EACH COMPLETE SYMBOL = 250,000 ACRES

STILL ORIGINAL TYPE

NOW ASPEN SCRUB OAK

NOW BRUSH OR GRASS

Considering all forest types (including aspen and scrub oak) 8 per cent of the present forest area can be classified as sawtimber, that is, it bears at least 2,000 board feet per acre in trees 9 inches and over diameter. Only one-fourth of this or 1.8 per cent of the total is rated as old growth. From Tables 3 and 4, it will be seen that the sawtimber area is divided about one-quarter pine, one-quarter aspen, one-quarter better hardwoods, and one-quarter in the other types.

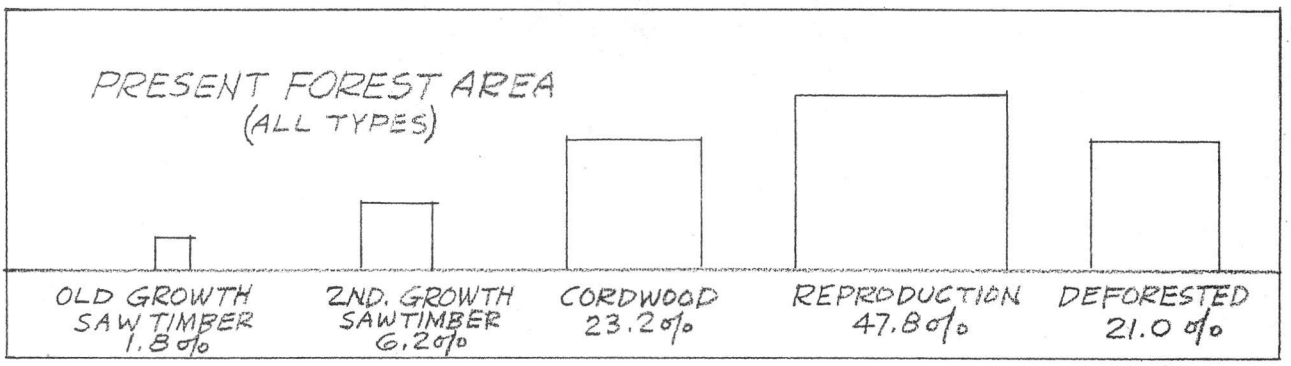
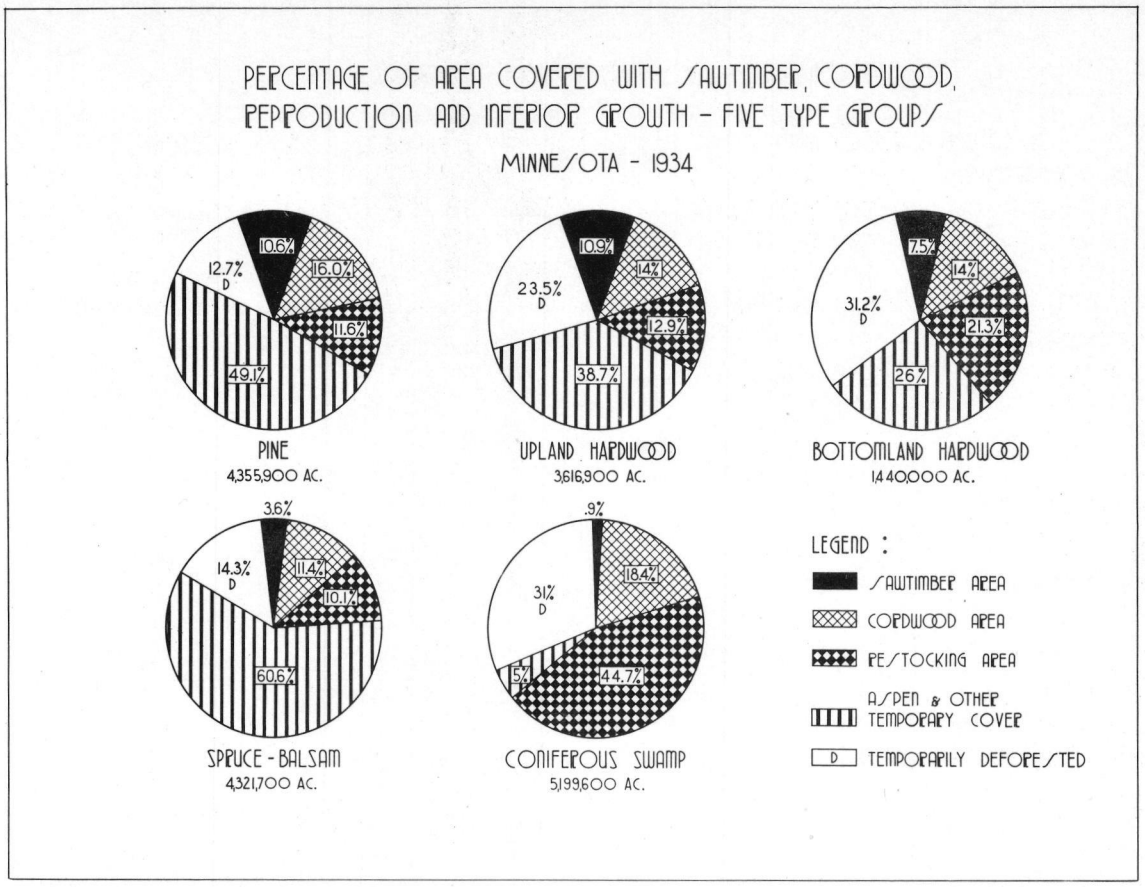
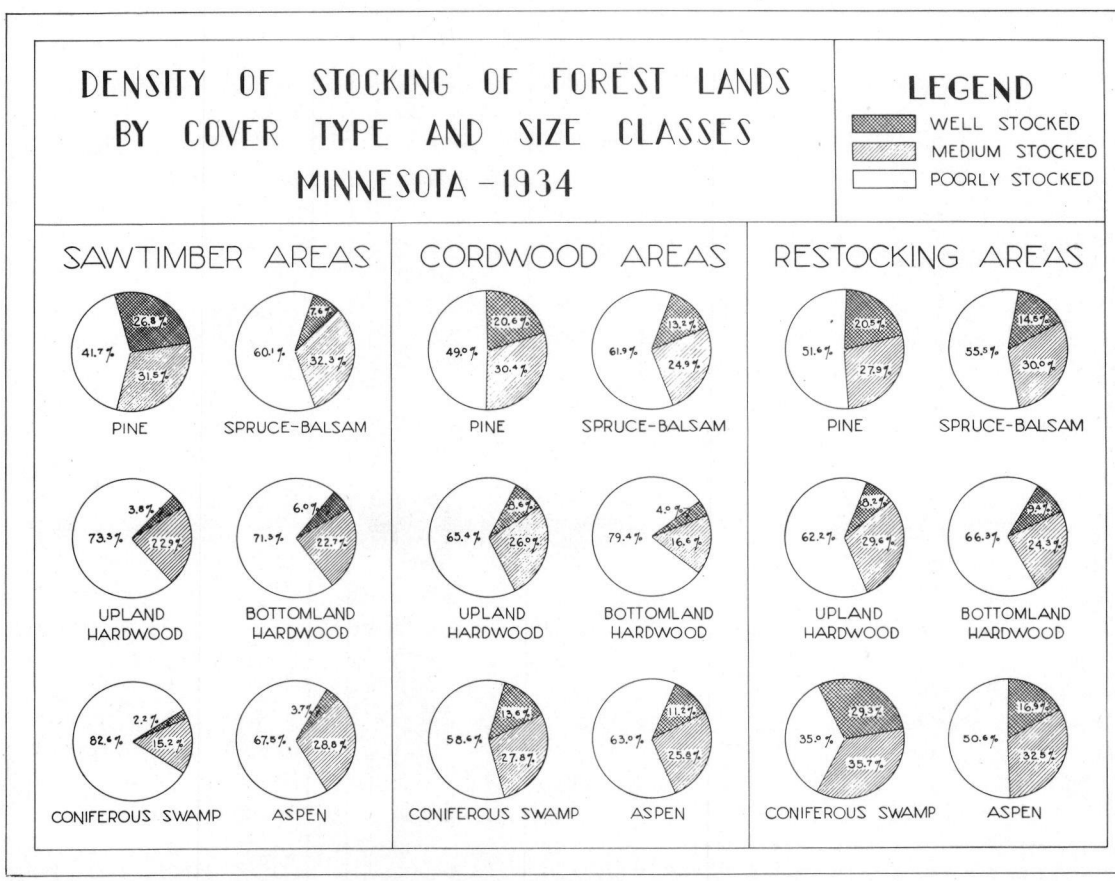


Table 4 also shows the distribution of cordwood areas of merchantable size, that is, areas which bear 3 cords or more per acre in trees 5 inches or more in diameter. The most extensive areas are in the aspen and scrub oak types - 1,707,100 acres; the most valuable in the spruce-balsam and spruce swamp types - 1,114,400 acres. In the reproduction column, there is a notable shortage of white and Norway pine, a strong preponderance of aspen.

It is difficult to convey a clear picture of the changes which have taken place in the forests of the State in any simple statement of type areas. The gradual deterioration of some of the hardwood stands through repeated culling, the destruction of young growth and damage to older trees by pasturing, the constant thinning out of the pine stands by forest fires and intermittent trespass cutting, and the frustration of some of the swamp forests by Christmas tree harvests and premature pulpwood operations, can only be inferred from predominance of inferior types, the shortage of merchantable areas, and the common understocking of the stands.

In Table 5, it will be seen that only 9.3 per cent of the million and a half acres of sawtimber can be rated as well stocked, while 63.5 per cent is poorly stocked, that is, bears less than 5,000 board feet per acre. Similarly, Table 6 shows that only 12.5 per cent of the cordwood area is well stocked, while 61.5 per cent has a poor stocking. Even the reproducing areas are generally understocked, as will be seen in Table 7.


PERCENTAGE OF AREA COVERED WITH SAWTIMBER, CORDWOOD, REPRODUCTION AND INFERIOR GROWTH - FIVE TYPE GROUPS
MINNESOTA - 1934
10.6%
16.0%
12.7% D
11.6%
49.1%
PINE
4,355,900 AC.
10.9%
14%
23.5% D
12.9%
38.7%
UPLAND HARDWOOD
3,616,900 AC.
7.5%
14%
31.2% D
21.3%
26%
BOTTOMLAND HARDWOOD
1,440,000 AC.
3.6%
11.4%
14.3% D
10.1%
60.6%
SPRUCE - BALSAM
4,321,700 AC.
.9%
18.4%
31% D
5%
44.7%
CONIFEROUS SWAMP
5,199,600 AC.
LEGEND :
SAWTIMBER AREA
CORDWOOD AREA
RESTOCKING AREA
ASPEN & OTHER TEMPORARY COVER
D TEMPORARILY DEFORESTED


DENSITY OF STOCKING OF FOREST LANDS
BY COVER TYPE AND SIZE CLASSES
MINNESOTA - 1934
LEGEND
WELL STOCKED
MEDIUM STOCKED
POORLY STOCKED
SAWTIMBER AREAS
CORDWOOD AREAS
RESTOCKING AREAS
PINE
SPRUCE-BALSAM
UPLAND HARDWOOD
BOTTOMLAND HARDWOOD
CONIFEROUS SWAMP
ASPEN

LOCATION OF REMAINING TIMBER

In the forest inventory taken in 1934, the State of Minnesota was divided into six forest units and the data were compiled separately in each. The first four units include the bulk of the area within the northern coniferous forest region, Unit 5 takes in the hardwood region which is now very largely in farms, while Unit 6 includes the true prairie together with some of the scrub growth in the northwest. The division between Units 1, 2, 3, and 4 is largely on economic grounds, although in this region it must be recognized that there are no clear-cut trade area boundaries. Table 8 shows the extent of the six units and the percentage of land which is covered with forest.

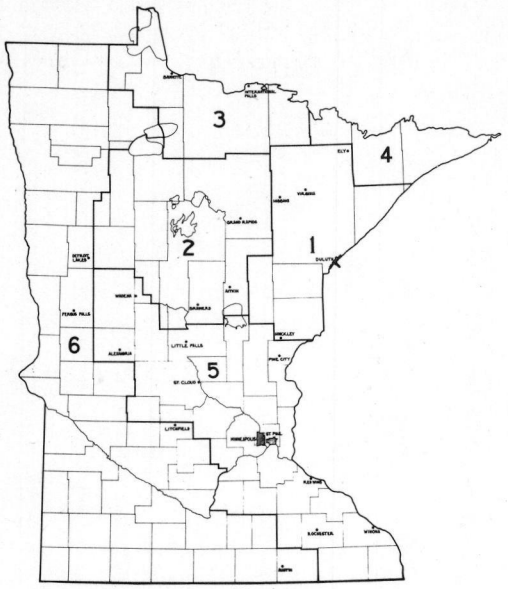
In Tables 9, 10, 11 and 12, the important characteristic of the economic units stand out.

Unit 1, the area tributary to Duluth, is seen to be more thoroughly cut-over than any of the other units (disregarding Unit 6 which was never heavily forested). The important sawtimber type in this area was pine. Of this type there remain only 3,200 acres of old growth in widely scattered patches, and 19,700 acres of second growth. Around the exterior boundaries of this unit, particularly in the north end, there still remain some fair cordwood areas of spruce-balsam and coniferous swamp. All told, there are 575,800 acres of cordwood, of which 307,500 acres are of the types used extensively for pulpwood.

Unit 2, which centers around the old lumber towns of Bemidji, Walker, Akely, Cass Lake, Deer River and the newer pulp industries at Grand Rapids, Brainerd, Little Falls and Sartell, was the heart of the original Minnesota pineries, and the suitability of much of the land for pine is reflected in the nature of the second growth. The presence of 46,600 acres of old growth pine can be accounted for in large part by the public reservations on the Chippewa National Forest, Itasca State Park and the Red Lake Indian Reservation. The 91,800 acres of second growth pine sawtimber and 249,900 acres of pine cordwood are mainly jack pine stands which have come in since the original logging.

Unit 3, which centers around International Falls, is predominantly swamp but with sufficient area of productive upland to rank it comparatively high as a producer of white pine, white spruce and balsam. It will be seen that Unit 3 has the largest area of old growth pine remaining in the State, also more spruce balsam sawtimber than any other unit. It contains comparatively little jack pine cordwood but contains far more spruce and balsam pulpwood than any of the other areas. Large areas of spruce swamp in this unit are rated as non-productive. The site is so poor that trees large enough to make pulpwood cannot be grown in 100 years.

FOREST SURVEY UNITS IN MINNESOTA



Economic Units in Minnesota

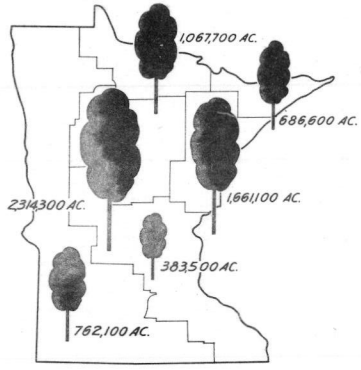
Unit Designation

1. Cloquet
2. Central Pine
3. Rainy River
4. Superior
5. Hardwood
6. Prairie

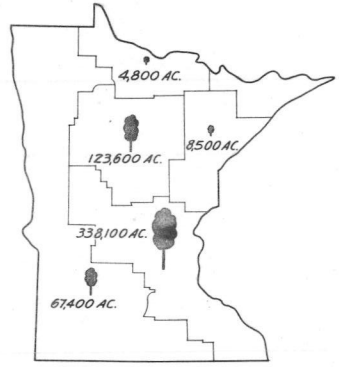
In Units 1, 2, 3 and 5, comprising 16 million acres of forest land, the inventory was made by means of a line plot survey, the entire area being gridironed with strips 10 miles apart and with one-fifth-acre sample plots measured at intervals of 660 feet along the lines. Altogether 5,000 miles of line were run and over 40,000 sample plots measured. In Unit 4, which lies mainly within the Superior National Forest, the estimate of forest areas is based upon intensive timber surveys covering about one quarter of the total area but well distributed over the unit. In these intensive surveys, lines were run either an eighth or a quarter of a mile apart. In Unit 6, which is mainly prairie, the area estimate is based upon rough reconnaissance in conjunction with the 1930 Census Bureau figure of "Woodland in Farms."

ACREAGE OF INFERIOR FOREST GROWTH BY ECONOMIC UNITS

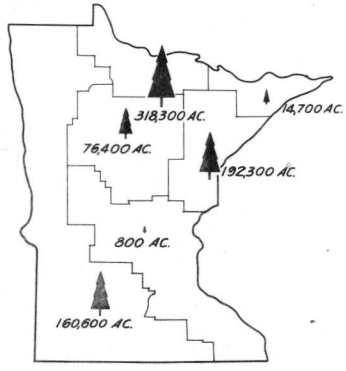
MINNESOTA - 1934



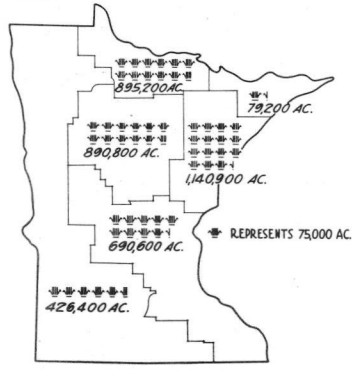
ASPEN



SCRUB OAK



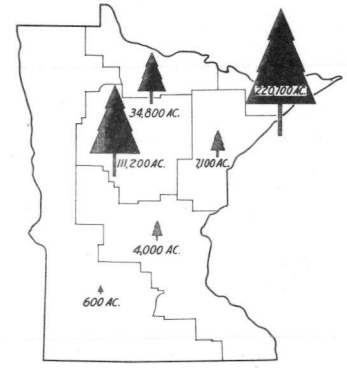
NON-PRODUCTIVE SWAMP



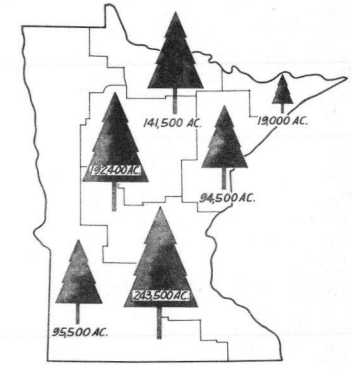
DEFORESTED LAND

ACREAGE OF SAWTIMBER AND CORDWOOD OF MAIN COMMERCIAL TYPES BY ECONOMIC UNITS

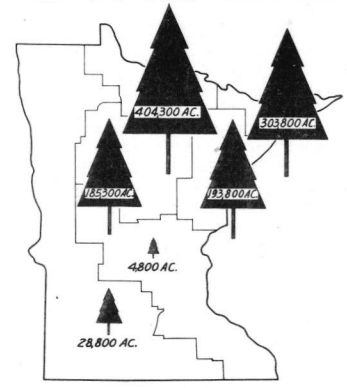
MINNESOTA - 1934



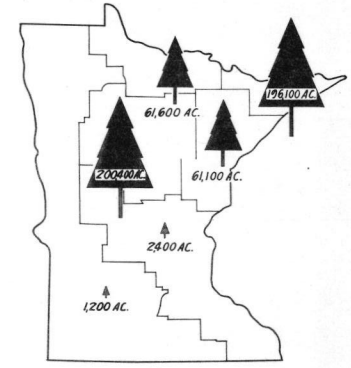
ACREAGE OF PINE SAWTIMBER



ACREAGE OF OTHER SAWTIMBER



ACREAGE OF SPRUCE CORDWOOD
(SPRUCE BALSAM AND CONIFEROUS SWAMP)



ACREAGE OF JACK PINE CORDWOOD

Unit 4 is a reserve supply of timber available to Duluth or International Falls. The greater part of the 33,600 acres of old growth sawtimber is in private ownership and is subject to exploitation. Much of the second growth aspen and pine, aggregating over 300,000 acres, is in public ownership and can be conservatively utilized. The same is true of the large area of cordwood. This unit now contains over a half million acres of pulpwood species, jack pine, spruce and balsam. It is surpassed only by Unit 3.

Unit 5, as previously stated, is mainly in farms. Only 20.4 per cent of the land area is now forested. Most of this area of course is in the nature of woodlots. There remain about a quarter of a million acres which can be rated as sawtimber, but most of this has been more or less culled over and hacked into, grazed and burned. There are 679,500 acres of cordwood, less than 5 per cent of which is of pulpwood types. About half is valuable hardwoods, half aspen and scrub oak. The cordwood in scrub trees, tops and limbs has greater economic importance than in the northern unit, for the reason that it is near farm settlements, villages and cities and can be utilized for fuel. Corresponding material in the far north is commercially unavailable.

Unit 6, the prairie region, has little significance from the standpoint of commercial wood supplies. Only 8.8 per cent of the land is forested. The wood grown here, however, is extensively used for fuel and fence posts and a few trees are cut every year for local lumber. In the sawtimber stands, of which there are 96,100 acres, American elm is the outstanding species. It is not much sought after for either lumber or cordwood, which doubtless accounts for its survival. Cottonwood, basswood, and soft maple also commonly reach sawtimber size. In the cordwood, of which there are 380,900 acres, aspen, burr oak, and box elder are the most common species.

SIGNIFICANCE OF AREA STATISTICS

The timber which Minnesota will be able to cut from her native forests in the next forty years will come not from areas now barren or reforesting, nor can it come to any large extent from the areas now occupied with brush, aspen, scrub oak and other inferior types. Rather, sawtimber and pulpwood for the near future must be obtained from the scattered tracts of virgin woods and the second growth now approaching merchantable size. In fact, such a large share of the remaining virgin timber is so inaccessible or is likely to be withheld from commercial use for recreational purposes, that the wood supply problem centers very largely on the second growth sawtimber and cordwood stands. The importance of saving and conservatively managing these areas, therefore, cannot be over-emphasized.

The best remaining old growth pine is to be found on the township of land in Itasca State Park, the Ten Sections and Star Island in the Chippewa National Forest, on the ten thousand-acre Ponemah Peninsula, on the Red Lake Indian Reservation, and on scattered privately owned lands in southeastern Koochiching and northern Lake and Cook counties.

Promising second growth of both pine and spruce is found on the Superior National Forest in Unit 4. This forest, when created in 1909, was considered to be of very little value, since it had been badly burned some 45 years previously and practically all remaining tracts of merchantable pine had been acquired by private companies. Furthermore, the area was very inaccessible. In the succeeding 25 years, however, the pine and spruce reproduction has reached merchantable size and the exhaustion of pulpwood supplies near to the mills is creating a demand for the more accessible parts of the Government timber. Thus, timely selection of young second growth areas and protection of these areas from fire is going to make it possible to maintain certain industries and continue extensive woods work which otherwise would soon be a thing of the past.

Similarly, much promising second growth is found on the Chippewa National Forest in Unit 2, largely as a result of leaving the cut-over land in good condition (with seed trees well distributed) and a quarter century of good fire protection. These two examples of simple forest management indicate that conditions are naturally favorable for forest development in northern Minnesota, and given a reasonable opportunity, nature will reclothe the landscape with valuable growing timber.

As shown by the statistics, there are still considerable areas of jack pine and spruce of cordwood or small pole size in all of the northern Minnesota units, sufficient in fact to maintain many industries on a permanent basis. The past record as reflected in the present picture of forest land conditions in Minnesota, however, does not hold forth much hope that, without some changes in policy, many of these areas will be suitably cared for, nor that the general deterioration of the stands will be arrested.

A logical aim of public forest policy would, therefore, seem to be to pick out the most promising of these restocking areas from the standpoint of stocking, productivity, accessibility and local needs, and to take whatever steps seem necessary to maintain the areas in a productive condition, whether this means public acquisition, public grants in aid, or public control.

In some of the later Forest Survey releases, it is proposed to analyze the remaining timber volumes and rate of timber growth in relation to the present industrial needs of each economic unit, and thus lay somewhat of a foundation for determining the extent of public effort which is justifiable in the various parts of the State.

TABLE I.

COMPARISON OF ORIGINAL AND PRESENT FOREST AREAS OF MINNESOTA

General Forest Land Type	Original Forest Area (Approx.)	Area now Covered with Forest Growth	
	Acres	Acres*	Percent
Pine	5,800,000	4,355,900	75.1
Spruce-balsam	6,300,000	4,321,700	68.6
Coniferous swamp	6,100,000	5,199,600	85.2
Upland Hardwood	8,400,000	3,616,900	43.1
Bottomland Hardwood	2,000,000	1,440,000	72.0
Scrub	2,900,000	681,300	23.5
	31,500,000	19,615,400	62.3
Shelterbelts		86,300	
Non-forest	19,526,000	31,324,300	
Total land area	51,026,000	51,026,000	

*The areas given in this column include not only all of the remnants of the original type, but other forest areas temporarily covered with aspen, brush, etc., which indicate, by seed trees, stumps and characteristic soil and ground cover, their relationship to the original type. These areas are broken down in more detail in Tables II and III.

TABLE II.

CHARACTER OF COVER ON PRESENT FOREST AREA OF MINNESOTA.

General Forest Land Type	Total Forest Area Remaining	Area Occupied by Original Type*	Area now Occupied by Aspen & Scrub Oak	Area Temporarily Deforested
Pine	4,355,900	1,670,200	2,134,800	550,900
Spruce-Balsam	4,321,700	1,088,300	2,615,900	617,500
Coniferous Swamp	5,199,600	3,330,400	260,900	1,608,300
Upland Hardwood	3,616,900	1,369,600	1,398,900	848,400
Bottomland Hardwood	1,440,000	616,100	374,300	449,600
Scrub	681,300		632,900	48,400
Total	19,615,400	8,074,600*	7,417,700*	4,123,100
Percent of Total	100.0	41.2	37.8	21.0
Shelterbelts	86,300			

*There are some minor inconsistencies in these type areas inasmuch as a fraction of the present pine forest is on natural hardwood or natural spruce land and similar encroachments occur in other types. The table shows the present area of these cover types regardless of the type of land on which they occur.

The area shown as deforested, although bearing no appreciable amount of forest cover, is intermixed with the forested land and shows no evidence of permanent alienation. Barren areas and areas cleared for other uses such as pasture land are not included.

TABLE III.

CLASSIFICATION OF PRESENT COVER TYPE AREAS
ON BASIS OF SIZE OF TIMBER

Cover Type	Thousand Acres	Percentage Distribution					
		Total	Old Growth Sawtbr.	Second Growth Sawtbr.	Cordwood	Reproduction	Deforested
Pines	1,670.2	100.0	8.1	19.6	41.5	30.8	
Spruce-Balsam	1,088.3	100.0	2.2	12.1	45.5	40.2	
Coniferous Swamps	3,330.4	100.0	.1	1.4	28.7	69.8	
Upland Hardwoods	1,369.6	100.0	9.8	19.0	37.0	34.2	
Bottomland Hardwoods	616.1	100.0	4.4	13.0	32.6	50.0	
Aspen - Scrub Oak, etc.	7,417.7	100.0	.2	5.1	23.0	71.7	
Pastured Groves	565.8	100.0					100.0
Brush-Grass	3,557.3	100.0					100.0
All Types	19,615.4		1.8	6.2	23.2	47.8	21.0
Shelterbelts	86.3		1.5	16.7	58.6	23.2	

The term "old growth" is applied to stands which have over 2,000 board feet per acre, the bulk of which is in trees over 15 inches in diameter.

"Second growth" describes stands which have over 2,000 board feet per acre, the bulk of which is in trees from 9 to 15 inches in diameter at breast height.

"Cordwood" refers to stands which contain 3 cords or more per acre, but fall short of having 2,000 board feet of sawtimber.

The term "reproduction" applies to areas which have at least 100 small trees of commercially valuable species per acre ranging in size from 2 feet in height to 5 inches in diameter, but which lack enough large size trees to make 3 cords or 2,000 board feet.

TABLE IV.

SIZE CLASS OF TIMBER IN ACRES, 1934.

Cover Type	Total Area of Type	Old Growth Sawtbr.	Second Growth Sawtbr.	Cordwood	Reproduction
PINE					
Jack Pine	1,266,000	2,400	280,100	522,800	460,700
Norway Pine	170,500	27,600	34,200	78,700	30,000
White Pine	233,700	106,000	13,200	91,300	23,200
Total Pine	1,670,200	136,000	327,500	692,800	513,900
SPRUCE-BALSAM	1,088,300	24,000	131,700	495,300	437,300
SWAMP CONIFERS					
Spruce	1,529,800		18,900	619,100	891,800
Tamarack	656,900		9,300	144,500	503,100
Cedar	380,600	2,600	18,300	186,100	173,600
Non-productive	763,100			6,400	756,700
Total Swamp	3,330,400	2,600	46,500	956,100	2,325,200
HARDWOODS					
Maple, etc.	893,600	106,100	177,300	248,600	361,600
Oak	476,000	28,800	82,300	258,300	106,600
Total Hardwoods	1,369,600	134,900	259,600	506,900	468,200
MISCELLANEOUS					
Aspen	6,309,800	18,300	377,800	1,315,500	4,598,200
Aspen Scrub	565,500			103,100	462,400
Scrub Oak	542,400			288,500	253,900
Total Misc.	7,417,700	18,300	377,800	1,707,100	5,314,500
BOTTOMLAND HARDWOODS	616,100	27,300	80,300	200,700	307,800
Total Forested	15,492,300	343,100	1,223,400	4,558,900	9,366,900
Deforested	4,123,100				
	19,615,400				
Shelterbelt	86,300				
	19,701,700				

TABLE V.

CLASSIFICATION OF SAWTIMBER AREA ON BASIS OF DENSITY OF STOCKING

1934

Cover Type Group	Percentages			
	All Classes	Well Stocked	Medium Stocked	Poorly Stocked
Pine	100.0	26.8	31.5	41.7
Spruce-Balsam	100.0	7.6	32.3	60.1
Coniferous Swamp	100.0	2.2	15.2	82.6
Upland Hardwood	100.0	3.8	22.9	73.3
Bottomland Hardwoods	100.0	6.0	22.7	71.3
Aspen	100.0	3.7	28.8	67.5
Total	100.0	9.3	27.2	63.5

Note: Stands bearing 10 M board feet or more per acre in trees 9 inches and larger diameter were classified as well stocked; from 5 to 10 M per acre as medium stocked, and from 2 to 5 M per acre as poorly stocked. Stands with less than 2 M per acre were not rated as sawtimber stands. (Data from Units 4 and 6 not included in above proportions.)

TABLE VI.

CLASSIFICATION OF CORDWOOD AREAS ON BASIS OF DENSITY OF STOCKING

1934

Cover Type Group	Percentages			
	Total	Well Stocked	Medium Stocked	Poorly Stocked
Pine	100.0	20.6	30.4	49.0
Spruce-Balsam	100.0	13.2	24.9	61.9
Coniferous Swamp	100.0	13.6	27.8	58.6
Upland Hardwood	100.0	8.6	26.0	65.4
Bottomland Hardwood	100.0	4.0	16.6	79.4
Scrub Oak	100.0	11.0	23.9	65.1
Aspen	100.0	11.2	25.8	63.0
Total	100.0	12.5	26.0	61.5

Note: Stands bearing 12½ cords or more per acre in trees 5 inches and larger diameter were classified as well stocked; from 7.6 to 12.5 cords per acre as medium stocked; and from 3 to 7.5 cords per acre as poorly stocked. With less than 3 cords they were not considered cordwood. (Data from Units 4 and 6 not included in above proportions.)

TABLE VII.

CLASSIFICATION OF REPRODUCING AREA ON BASIS OF DENSITY OF STOCKING

1934

Cover Type Group	Percentages			
	Total	Well Stocked	Medium Stocked	Poorly Stocked
Pine	100.0	20.5	27.9	51.6
Spruce-Balsam	100.0	14.5	30.0	55.5
Coniferous Swamp	100.0	29.3	35.7	35.0
Upland Hardwood	100.0	8.2	29.6	62.2
Bottomland Hardwood	100.0	9.4	24.3	66.3
Aspen	100.0	16.9	32.5	50.6
Scrub Oak	100.0	1.4	22.8	75.8
All Types	100.0	18.8	32.2	49.0

Note: Areas on which 70 per cent or more of the growing space is occupied by seedlings or saplings less than 5 inches in diameter are classified as well stocked; areas with 40 to 70 per cent of area occupied are called medium stocked; and from 10 to 40 per cent, poorly stocked. Areas with fewer than 100 trees per acre, or less than 10 per cent of area occupied by reproduction of commercial species, were considered deforested. (Data from Units 4 and 6 not included in above proportions.)

TABLE VIII.

FOREST AREA BY ECONOMIC UNITS

Unit	Gross Land Area	Area Now in Forest	Percentage
I. Duluth	5,369,400	4,329,900	80.6
II. Central Pine Area	7,206,000	5,284,900	73.3
III. International Falls	4,141,100	3,808,400	92.0
IV. Superior	2,101,300	2,030,700	96.6
Subtotal Northern Minn.	18,817,800	15,453,900	82.1
V. Big Woods Belt	11,356,300	2,318,300	20.4
VI. Prairie Region*	20,851,900	1,843,200	8.8
Subtotal Southern Minn.	32,208,200	4,161,500	12.9
State Total	51,026,000	19,615,400	38.4
Shelterbelt		86,300	.2

Unit 1 includes the territory now largely cut-over which is definitely tributary to the wood-using and shipping centers, Duluth Cloquet and Superior. (See map)

Unit 2 includes the pine region at the head of the Mississippi centering around such wood-using towns as Bemidji, Brainerd, Cass Lake, Deer River and Grand Rapids.

Unit 3, which contains some pine but mainly swamp, finds its natural outlet at International Falls.

Unit 4 takes in the public and private lands within the exterior boundaries of the Superior National Forest (as of 1934) and the Pigeon River State Forest. This is a reserve supply of timber available to Duluth or International Falls.

Unit 5 is primarily farming country, the timberland being in the nature of farm woodlots and patches along bluffs or streams.

Unit 6 is essentially prairie although it contains fairly large areas of fringe forest, woodlots and shelterbelts of greater or less local importance. Few of the forests here can be considered as commercial areas.

*Shelterbelt not included in forest area.

TABLE IX.

DISTRIBUTION OF OLD GROWTH SAWTIMBER BY ECONOMIC UNITS

1934

Unit No.	All Types	Pines, (Jack, Norway, White)	Hardwood, including Bottomland	Spruce-Balsam & Swamp Conifers	Aspen and Scrub Oak
	Acres	Acres	Acres	Acres	Acres
Unit 1	23,600	3,200	11,000	6,300	3,100
Unit 2	66,600	46,600	9,200	6,900	3,900
Unit 3	80,800	51,000	7,200	12,900	9,700
Unit 4	33,600	33,600			
Subtotal	204,600	134,400	27,400	26,100	16,700
Unit 5	104,100	1,600	100,900		1,600
Unit 6	34,400		33,900	500	
Subtotal	138,500	1,600	134,800	500	1,600
All Units	343,100	136,000	162,200	26,600	18,300

TABLE X.

DISTRIBUTION OF SECOND GROWTH SAWTIMBER BY ECONOMIC UNITS

1934

Unit No.	All Types	Pines, (Jack, Norway White)	Hardwood, including Bottomland	Spruce-Balsam & Swamp Conifers	Aspen and Scrub Oak
	Acres	Acres	Acres	Acres	Acres
Unit 1	135,200	19,700	25,200	36,200	54,100
Unit 2	373,000	91,800	97,400	51,700	132,100
Unit 3	189,400	24,300	12,100	68,800	84,200
Unit 4	303,900	187,100	1,900	17,100	97,800
Subtotal	1,001,500	322,900	136,600	173,800	368,200
Unit 5	160,200	4,000	145,800	800	9,600
Unit 6	61,700	600	57,500	3,600	
Subtotal	221,900	4,600	203,300	4,400	9,600
All Units	1,223,400	327,500	339,900	178,200	377,800

TABLE XI.

DISTRIBUTION OF MERCHANTABLE CORDWOOD AREAS BY ECONOMIC UNITS 1934

Unit No.	All Types	Pines, (Jack, Norway, White)	Hardwood, including Bottomland	Spruce-Balsam & Swamp Conifers	Aspen and Scrub Oak
	Acres	Acres	Acres	Acres	Acres
Unit 1	575,800	80,600	40,800	246,400	208,000
Unit 2	1,132,500	249,900	139,800	249,300	493,500
Unit 3	851,500	83,300	29,900	560,700	177,600
Unit 4	938,700	270,600	200	326,600	341,300
Subtotal	3,498,500	684,400	210,700	1,383,000	1,220,400
Unit 5	679,500	5,600	347,100	26,400	300,400
Unit 6	380,900	2,800	149,800	42,000	186,300
Subtotal	1,060,400	8,400	496,900	68,400	486,700
All Units	4,558,900	692,800	707,600	1,451,400	1,707,100

TABLE XII.

SEGREGATION OF CORDWOOD AREAS IN THE MAIN PULPWOOD TYPES By Economic Units, 1934.

Unit No.	Area Pulpwood Types	Jack Pine	Upland Spruce-Balsam	Swamp Spruce	Cedar & Tamarack Bogs
	Acres	Acres	Acres	Acres	Acres
Unit 1	307,500	61,100	149,800	44,000	52,600
Unit 2	449,700	200,400	116,600	68,700	64,000
Unit 3	622,300	61,600	141,100	263,200	156,400
Unit 4	522,700	196,100	81,400	222,400	22,800
Subtotal	1,902,200	519,200	488,900	598,300	295,800
Unit 5	28,800	2,400	1,600	3,200	21,600
Unit 6	43,200	1,200	4,800	24,000	13,200
Subtotal	72,000	3,600	6,400	27,200	34,800
All Units	1,974,200	522,800	495,300	625,500	330,600

TABLE XIII.

DEFORESTED AREAS CLASSIFIED AS SUITABLE FOR FOREST PLANTING IN 5 ECONOMIC UNITS

Unit No.	All Types	Pines, (Jack, Norway, (White)	Hardwood, including Bottomland	Spruce, Balsam & Swamp Conifers	Aspen and Scrub Oak
	Acres	Acres	Acres	Acres	Acres
Unit 1	163,100	69,800	18,000	75,300	
Unit 2	198,400	149,000	34,700	14,700	
Unit 3	128,800	25,900	9,700	93,200	
Subtotal	490,300	244,700	62,400	183,200	
Unit 4	40,000	24,000		16,000	
Unit 5	43,200	20,000	22,400	800	
Subtotal	83,200	44,000	22,400	16,800	
All Units	573,500	288,700	84,800	200,000	

The areas classified as suitable for planting were the upland forest areas with no appreciable amount of alder, willow, hazel or other obstructions which would seriously interfere with the establishment and development of seedlings. On approximately five-sixths of the deforested area, brush, poor drainage, rock or rough topography stood in the way of easy artificial reforestation.